THAT WHICH IS CLAIMED IS:

1. Process for estimating the successive values of digital symbols which can each take M different possible values, on the basis of the successive values of digital samples (r_i) each of which results from the combination of at most L successive symbols (s_i), comprising a stage-by-stage progression through a trellis of the Viterbi type with M^k states, with k less than or equal to L-1, all the states of all the stages being respectively endowed with aggregate metrics, characterized in that when taking into account the sample of rank n, all the transitions arriving at the various states of the current stage of the trellis are partitioned into M groups (GRD-GR3), each group containing all the transitions arising from the states of the preceding stage which are associated with one of the M possible values of the symbol of rank n-k, the various aggregate metrics are calculated for these various states of the current stage (ETG_n) of the trellis, that one of the transitions which leads to the state endowed with a maximum aggregate metric is determined in each group, and a unique decision is taken regarding the value of the symbol of rank n-k by detecting the group associated with the extremum of these M extremum aggregate metrics, this unique decision being endowed with a symbol-confidence index formulated from these M extremum aggregate metrics.

2. Process for equalizing an information transmission channel, the transmission channel having an impulse response with L coefficients and delivering successive digital samples (r_i) corresponding to successively transmitted symbols (s_i) which can each take M different possible values, the process

comprising a processing for estimating the successive values of the symbols by progressing stage by stage through a trellis of the Viterbi type with M^k states, with k less than or equal to L-1, all the states of all the stages being respectively endowed with aggregate metrics, characterized in that on receipt of the sample of rank n, all the transitions arriving at the various states of the current stage of the trellis are partitioned into M groups, each group containing all the transitions arising from the states of the preceding stage which are associated with one of the M possible values of the symbol of rank n-k, the various aggregate metrics are calculated for these various states of the current stage (ETG_n) of the trellis, that one of the transitions which leads to the state endowed with a maximum aggregate metric is determined in each group, and a unique decision is taken regarding the value of the symbol of rank n-k by detecting the group associated with the extremum of these M extremum aggregate metrics, this unique decision being endowed with a symbol-confidence index formulated from these M extremum aggregate metrics.

3. Process according to Claim 1 or 2, characterized in that the aggregate metrics are error cues aggregated between the observed values and the expected values of the samples, and in that in each group that one of the transitions which leads to the state endowed with a minimum aggregate metric is determined, and a unique decision is taken regarding the value of the symbol of rank n-k (s_{n-2}) by detecting (84) the group associated with the smallest of these M minimum aggregate metrics, this unique decision being endowed with a symbol-confidence index formulated from these M minimum aggregate metrics.

4. Process according to Claim 3, characterized in that M is equal to 2, in that the detection of the group associated with the smaller of the two minimum aggregate metrics comprises the calculation of the difference between the two minimum aggregate metrics, the sign of this difference yielding the said unique decision regarding the value of the symbol of rank n-k (s_{n-2}), the absolute value of this difference yielding the value of the said symbol-confidence index.

5. Process according to Claim 3, characterized in that M is greater than 2, in that the detection of the group associated with the smallest of the M minimum aggregate metrics comprises a first selection (100) of the smallest of these M minimum aggregate metrics, and in that the formulation of the symbol-confidence index assigned to the said unique decision comprises a second selection (102), from among the M-1 remaining minimum aggregate metrics not selected on completion of the said first selection, of the smallest of these M-1 remaining minimum aggregate metrics, and the calculation of the difference (103) between the two minimum aggregate metrics arising respectively from the first and from the second selections, the positive value of this difference yielding the value of the said symbol-confidence index.

6. Process according to Claim 1 or 2, characterized in that the aggregate metrics are resemblance cues aggregated between the observed values and the expected values of the samples, and in that in each group that one of the transitions which leads to the state endowed with a maximum aggregate metric is determined, and a unique decision is taken regarding

the value of the symbol of rank n-k by detecting (85) the group associated with the largest of these M maximum aggregate metrics, this unique decision being endowed with a symbol-confidence index formulated from these M maximum aggregate metrics.

7. Process according to Claim 6, characterized in that M is equal to 2, in that the detection of the group associated with the larger of the two maximum aggregate metrics comprises the calculation of the difference between the two maximum aggregate metrics, the sign of this difference yielding the said unique decision regarding the value of the symbol of rank n-k, the absolute value of this difference yielding the value of the said symbol-confidence index.

8. Process according to Claim 6, characterized in that M is greater than 2, in that the detection of the group associated with the largest of the M maximum aggregate metrics comprises a first selection (110) of the largest of these M maximum aggregate metrics, and in that the formulation of the symbol-confidence index assigned to the said unique decision comprises a second selection (112), from among the M-1 remaining maximum aggregate metrics not selected on completion of the said first selection, of the largest of these M-1 remaining maximum aggregate metrics, and the calculation of the difference (113) between the two maximum aggregate metrics arising respectively from the first and from the second selections, the positive value of this difference yielding the value of the said symbol-confidence index.

9. Process according to Claim 5 or 8, characterized in that each symbol is formed of b bits, with M equal to 2^b, in that a bit-confidence index is formulated for each of the bits of the symbol of rank n-k elected on completion of the said unique decision, by using the said elected symbol (SEU) and at least one auxiliary symbol (SAX) formulated from the said elected symbol by complementing at least the value of the relevant bit.

10. Process according to Claim 9 taken in combination with Claim 5, characterized in that the formulation of the bit-confidence index for a relevant bit of the elected symbol comprises

- a first step in which a single auxiliary symbol (SAX) is formulated by complementing only the value of the relevant bit whilst leaving unchanged the values of the other bits of the elected symbol,
- a second step in which the minimum aggregate metric associated with the group of transitions to which the said auxiliary symbol (SAX) belongs is selected, and
- a third step in which the difference is formed between the minimum aggregate metric associated with the group of transitions to which the said elected symbol (SEU) belongs and the minimum aggregate metric associated with the group of transitions to which the said auxiliary symbol (SAX) belongs, the result of this difference yielding the value of the said bit-confidence index.

11. Process according to Claim 9 taken in combination with Claim 5, characterized in that the formulation of the bit-confidence index for a relevant bit of the elected symbol comprises

- a first step in which a set of auxiliary symbols (SAX_j) is formulated by complementing the value of the relevant bit and by conferring all the possible values on the other bits of the elected symbol,

- a second step in which the minimum aggregate metrics associated with the groups of transitions to which the auxiliary symbols (SAX_j) respectively belong are respectively selected,

- a third step in which the smallest of the minimum aggregate metrics respectively selected in the second step is selected, and

- a fourth step in which the difference is formed between the minimum aggregate metric associated with the group of transitions to which the said elected symbol belongs and the minimum aggregate metric selected in the third step, the result of this difference yielding the value of the said bit-confidence index.

12. Process according to Claim 9 taken in combination with Claim 8, characterized in that the formulation of the bit-confidence index for a relevant bit of the elected symbol comprises

- a first step in which a single auxiliary symbol (SAX) is formulated by complementing only the value of the relevant bit whilst leaving unchanged the values of the other bits of the elected symbol (SEU),

- a second step in which the maximum aggregate metric associated with the group of transitions to which the said auxiliary symbol (SAX) belongs is selected, and

- a third step in which the difference is formed between the maximum aggregate metric associated with the group of transitions to which the said elected symbol (SEU) belongs and the maximum aggregate metric

associated with the group of transitions to which the said auxiliary symbol (SAX) belongs, the result of this difference yielding the value of the said bit-confidence index.

13. Process according to Claim 9 taken in combination with Claim 8, characterized in that the formulation of the bit-confidence index for a relevant bit of the elected symbol comprises

- a first step in which a set of auxiliary symbols (SAX_j) is formulated by complementing the value of the relevant bit and by conferring all the possible values on the other bits of the elected symbol,
- a second step in which the maximum aggregate metrics associated with the groups of transitions to which the auxiliary symbols (SAX_j) respectively belong are respectively selected,
- a third step in which the largest of the maximum aggregate metrics respectively selected in the second step is selected, and
- a fourth step in which the difference is formed between the maximum aggregate metric associated with the group of transitions to which the said elected symbol (SEU) belongs and the maximum aggregate metric selected in the third step, the result of this difference yielding the value of the said bit-confidence index.

14. Process according to one of the preceding claims, characterized in that the trellis is a reduced trellis with M^k states, with k less than L-1.

15. Process according to Claim 14, characterized in that the states of the current stage of rank n of the trellis correspond to the assumptions

regarding the k symbols of rank n to n-k+1, in that after having taken the unique decision regarding the symbol of rank n-k, one and the same tag (EST) containing the values of the symbols of rank n-k to n-L+2 respectively obtained upon the L-k-1 takings of successive unique decisions is associated with all the states of the current stage (ETG_n) of the trellis, and in that the aggregate metric of each state of the stage of rank n of the trellis is calculated from

the transition metric associated with the transition ending up at the said state of the stage of rank n and arising from the state of the stage of rank n-1 corresponding to the value of the symbol of rank n-k, contained in the said tag, and from the aggregate metric associated with the state of the stage of rank n-1 from which the said transition arises.

16. Process according to Claim 15, taken in combination with Claims 2 and 6, characterized in that the samples received are filtered by a filter (FA) matched to the impulse response of the channel, and in that the estimation processing is performed on the filtered samples.

17. Process according to one of the preceding claims, characterized in that the progression through the trellis is conditioned to the takings of successive unique decisions regarding the values of the symbols.

18. Device for estimating the successive values of digital symbols which can each take M different possible values, comprising reception means able to receive successive values of digital samples each of which results from the combination of at most L

successive symbols (s_1), and estimation means (MEST) able to estimate the successive values of the symbols by progressing stage by stage through a trellis of the Viterbi type with M^k states, with k less than or equal to L-1, all the states of all the stages being respectively endowed with aggregate metrics, characterized in that the estimation means (MEST) comprise

- partitioning means (MPT) able, on taking into account the sample of rank n, to partition all the transitions arriving at the various states of the corresponding current stage of the trellis into M groups, each group containing all the transitions arising from the states of the preceding stage which are associated with one of the M possible values of the symbol of rank n-k,
- calculation means (MCL) able to calculate for these various states of the current stage of the trellis the various aggregate metrics,
- determination means (MDT) able to determine in each group that one of the transitions which leads to the state endowed with the extremum aggregate metric,
- decision taking means (MPD) able to take a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with the extremum of these M extremum aggregate metrics, and
- first formulation means (MEB1) able to formulate, from these M extremum aggregate metrics, a symbol-confidence index assigned to this unique decision.

19. Device for equalizing an information transmission channel, comprising a memory (MM) containing L coefficients representative of the impulse

response of the transmission channel, reception means able to receive successive digital samples corresponding to successively transmitted symbols, each of which can take M different possible values, and an equalization block (BEQ) comprising estimation means (MEST) able to estimate the successive values of the symbols by progressing stage by stage through a trellis of the Viterbi type with Mk states, with k less than or equal to L-1, all the states of all the stages being respectively endowed with aggregate metrics, characterized in that the estimation means (MEST) comprise

- partitioning means (MPT) able, on receipt of the sample of rank n, to partition all the transitions arriving at the various states of the corresponding current stage of the trellis into M groups, each group containing all the transitions arising from the states of the preceding stage which are associated with one of the M possible values of the symbol of rank n-k,
- calculation means (MCL) able to calculate for these various states of the current stage of the trellis the various aggregate metrics,
- determination means (MDT) able to determine in each group that one of the transitions which leads to the state endowed with an extremum aggregate metric,
- decision taking means (MPD) able to take a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with the smallest of these M extremum aggregate metrics, and
- first formulation means (MEB1) able to formulate, from these M extremum aggregate metrics, a symbol-confidence index assigned to this unique decision.

20. Device according to Claim 18 or 19, characterized in that the aggregate metrics are error cues aggregated between the observed values and the expected values of the samples, in that the determination means (MDT) are able to determine in each group that one of the transitions which leads to the state endowed with a minimum aggregate metric, in that the decision taking means (MPD) are able to take a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with the smallest of these M minimum aggregate metrics, and in that the first formulation means (MEB1) are able to formulate the symbol-confidence index from these M minimum aggregate metrics.

21. Device according to Claim 20, characterized in that M is equal to 2, in that the decision taking means (MPD) comprise a subtractor (STR) able to calculate the difference between the two minimum aggregate metrics, the sign of this difference yielding the said unique decision regarding the value of the symbol of rank n-k, and in that the first formulation means (MEB1) comprise the said subtractor (STR), the absolute value of the difference calculated by the subtractor yielding the value of the said symbol-confidence index.

22. Device according to Claim 20, characterized in that M is greater than 2, in that the decision taking means (MPD) comprise first selection means (SEL1) able to perform a first selection of the smallest of these M minimum aggregate metrics, and in that the first formulation means (MEB1) comprise second selection means (SEL2) able to perform a second selection, from among the M-1 minimum aggregate metrics

not selected on completion of the said first selection, of the smallest of these M-1 remaining minimum aggregate metrics, and a subtractor (STR) able to calculate the difference between the two minimum aggregate metrics respectively arising from the first and from the second selections, the positive value of this difference yielding the value of the said symbol-confidence index.

23. Device according to Claim 18 or 19, characterized in that the aggregate metrics are resemblance cues aggregated between the observed values and the expected values of the samples, in that the determination means (MDT) are able to determine in each group that one of the transitions which leads to the state endowed with a maximum aggregate metric, in that the decision taking means (MPD) are able to take a unique decision regarding the value of the symbol of rank n-k by detecting the group associated with the largest of these M maximum aggregate metrics, and in that the first formulation means (MEB1) are able to formulate the symbol-confidence index from these M maximum aggregate metrics.

24. Device according to Claim 23, characterized in that M is equal to 2, in that the decision taking means (MPD) comprise a subtractor (STR) able to calculate the difference between the two maximum aggregate metrics, the sign of this difference yielding the said unique decision regarding the value of the symbol of rank n-k, in that the first formulation means (MEB1) comprise the said subtractor, the absolute value of the difference calculated by the subtractor yielding the value of the said symbol-confidence index.

25. Device according to Claim 23, characterized in that M is greater than 2, in that the decision taking means (MPD) comprise first selection means (SEL1) able to perform a first selection of the largest of these M maximum aggregate metrics, and in that the first formulation means (MEB1) comprise second selection means (SEL2) able to perform a second selection, from among the M-1 remaining maximum aggregate metrics not selected on completion of the said first selection, of the largest of these M-1 remaining maximum aggregate metrics, and a subtractor (STR) able to calculate the difference between the two maximum aggregate metrics respectively arising from the first and from the second selections, the positive value of this difference yielding the value of the said symbol-confidence index.

26. Device according to Claim 22 or 25, characterized in that each symbol is formed of b bits, with M equal to 2^b, in that it comprises second formulation means (MEB2) able to formulate a bit-confidence index for each of the bits of the symbol of rank n-k elected on completion of the said unique decision, by using the said elected symbol and at least one auxiliary symbol formulated from the said elected symbol by complementing at least the value of the relevant bit.

27. Device according to Claim 26 taken in combination with Claim 22, characterized in that the second formulation means comprise

- auxiliary formulation means (MX, CMP) able to formulate a single auxiliary symbol by complementing only the value of the relevant bit whilst

leaving unchanged the values of the other bits of the elected symbol,

- auxiliary selection means (SELX1) able to select the minimum aggregate metric associated with the group of transitions to which the said auxiliary symbol belongs, and

- an auxiliary subtractor (STRX) able to form the difference between the minimum aggregate metric associated with the group of transitions to which the said elected symbol belongs and the minimum aggregate metric associated with the group of transitions to which the said auxiliary symbol belongs, the result of this difference yielding the value of the said bit-confidence index.

28. Device according to Claim 26 taken in combination with Claim 22, characterized in that the second formulation means comprise

- auxiliary formulation means (MEBX) able to formulate a set of auxiliary symbols by complementing the value of the relevant bit and by conferring all the possible values on the other bits of the elected symbol,

- first auxiliary selection means (SELX1) able to select respectively the minimum aggregate metrics associated with the groups of transitions to which the auxiliary symbols respectively belong,

- second auxiliary selection means (SELX2) able to select the smallest of the minimum aggregate metrics respectively selected by the first auxiliary selection means, and

- an auxiliary subtractor (STRX) able to form the difference between the minimum aggregate metric associated with the group of transitions to which the said elected symbol belongs and the minimum

aggregate metric selected by the second auxiliary selection means, the result of this difference yielding the value of the said bit-confidence index.

29. Device according to Claim 26 taken in combination with Claim 25, characterized in that the second formulation means comprise

- auxiliary formulation means (MX, CMP) able to formulate a single auxiliary symbol by complementing only the value of the relevant bit whilst leaving unchanged the values of the other bits of the elected symbol,
- auxiliary selection means (SELX1) able to select the maximum aggregate metric associated with the group of transitions to which the said auxiliary symbol belongs, and
- an auxiliary subtractor (STRX) able to form the difference between the maximum aggregate metric associated with the group of transitions to which the said elected symbol belongs and the maximum aggregate metric associated with the group of transitions to which the said auxiliary symbol belongs, the result of this difference yielding the value of the said bit-confidence index.

30. Device according to Claim 26 taken in combination with Claim 25, characterized in that the second formulation means comprise

- auxiliary formulation means (MEBX) able to formulate a set of auxiliary symbols by complementing the value of the relevant bit and by conferring all the possible values on the other bits of the elected symbol,
- first auxiliary selection means (SELX1) able to select respectively the maximum aggregate

metrics associated with the groups of transitions to which the auxiliary symbols respectively belong,

- second auxiliary selection means (SELX2) able to select the largest of the maximum aggregate metrics respectively selected by the first auxiliary selection means, and

- an auxiliary subtractor (STRX) able to form the difference between the maximum aggregate metric associated with the group of transitions to which the said elected symbol belongs and the maximum aggregate metric selected by the second auxiliary selection means, the result of this difference yielding the value of the said bit-confidence index.

31. Device according to one of Claims 18 to 30, characterized in that the trellis is a reduced trellis with M^k states, with k less than L-1.

32. Device according to Claim 31, characterized in that the states of the current stage of rank n of the trellis correspond to the assumptions regarding the k symbols of rank n to n-k+1, in that the decision taking means are able to take a unique decision regarding the symbol of rank n-k, in that the estimation means are able to associate one and the same tag (EST) containing the values of the symbols of rank n-k to n-L+2 respectively obtained upon the L-k-1 takings of successive unique decisions delivered by the decision taking means with all the states of the current stage (ETG_n) of the trellis, and in that the calculation means (MCL) are able to calculate the aggregate metric of each state of the stage of rank n of the trellis from the transition metric associated with the transition ending up at the said state of the stage of rank n and arising from the state of the stage

of rank n-1 corresponding to the value of the symbol of rank n-k, contained in the said tag, and from the aggregate metric associated with the state of the stage of rank n-1 from which the said transition arises.

33. Device according to Claim 32, taken in combination with Claims 19 and 23, characterized in that the equalization block (BEQ) comprises at its head end a filter (FA) matched to the impulse response of the channel.

34. Digital information receiver, in particular cellular mobile telephone, characterized in that it incorporates a device as defined in one of Claims 18 to 33.

35. Computer program product recorded on a medium which can be used in a processor, comprising program-code means implementing the process as defined in one of Claims 1 to 17 when the said product is executed within a processor.